

IN THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) A method for detecting at least one nodule in a medical image of a subject, comprising:

identifying, in said medical image, an anatomical region corresponding to at least a portion of an organ of interest;

filtering said medical image to obtain a difference image;

detecting, in said difference image, a first plurality of nodule candidates within said anatomical region;

calculating respective nodule feature values of said first plurality of nodule candidates based on image pixel values of at least one of said medical image and said difference image;

removing false positive nodule candidates from said first plurality of nodule candidates based on said respective nodule feature values to obtain a second plurality of nodule candidates; and

determining said at least one nodule by classifying each of said second plurality of nodule candidates as a nodule or a non-nodule based on at least one of said image pixel values and said respective nodule feature values, wherein said detecting step includes

determining a respective center pixel having a maximum pixel value within a respective nodule region of each nodule candidate in the first plurality of nodule candidates;

calculating, for a first respective subregion that includes said respective center pixel within each respective nodule region, at least one first morphological image feature, said first respective subregion defined as those pixels having a pixel value above a first pixel threshold, but less than said maximum pixel value;

calculating, for a second respective subregion that includes said respective center pixel within each respective nodule region, at least one second morphological image feature,

said second respective subregion defined as those pixels having a pixel value above a second pixel threshold, but less than said maximum pixel value; and

determining said respective nodule region of each nodule candidate based on
respective differences between the at least one first morphological image feature and the at
least one second morphological image feature.

2. (Original) The method of claim 1, wherein the identifying step comprises:
forming a histogram of gray values of pixels in said medical image;
determining a gray-level threshold using said histogram; and
identifying an outline of said anatomical region using said gray-level threshold.

3. (Original) The method of claim 1, wherein the identifying step comprises:
identifying, in a low-dose computed tomographic (LDCT) image, a lung region of
said subject.

4. (Currently Amended) The method of claim 1, wherein the filtering step comprises:
filtering said medical image using a ~~matched~~ first filter to obtain a nodule-enhanced
image;
filtering said medical image using a ~~ring-average~~ second filter to obtain a nodule-
suppressed image; and
subtracting said nodule-suppressed image from said nodule-enhanced image to obtain
said difference image.

5. (Currently Amended) The method of claim 1, wherein the detecting step
comprises:

forming initial regions within said anatomical region; and
selecting said first plurality of nodule candidates based on said initial regions, each
nodule candidate in said first plurality of nodule candidates having [[a]] said respective
nodule region including one of said initial regions; ~~and~~
~~determining said respective nodule regions of each nodule candidate in said first~~
~~plurality of nodule candidates using region growing.~~

6. (Original) The method of claim 5, wherein the forming step comprises:
forming a histogram of gray values of pixels in said difference image; and
determining said initial regions using multiple-gray-level thresholding of said
histogram.
7. (Original) The method of claim 5, wherein the selecting step comprises:
calculating respective effective diameter and circularity values for each of said initial
regions; and
selecting said first plurality of candidate nodules based on said respective effective
diameter and circularity values of each of said initial regions.
8. (Cancelled)
9. (Currently Amended) The method of claim 1, wherein the calculating step
comprises:
determining, for each candidate nodule in said first plurality of candidate nodules, at
least one respective morphological feature value, including at least one of effective diameter,
circularity, and irregularity; and

determining, for each candidate nodule in said first plurality of candidate nodules, at least one respective gray level feature value, including at least one of a first nodule contrast in said difference image, a second nodule contrast in said medical image, a third nodule contrast of a nodule outer region, and a standard deviation of said nodule outer region.

10. (Original) The method of claim 9, wherein the removing step comprises:
removing false positive nodule candidates from said first plurality of nodule candidates based on said at least one respective morphological feature value and said at least one respective gray level feature value.

11. (Original) The method of claim 1, wherein the calculating step comprises:
determining, for each candidate nodule in said first plurality of candidate nodules, at least one respective interior feature value, including one of an average pixel value, full width at half maximum (FWHM), and full width at tenth maximum (FWTM), based on pixel values in an interior region of each candidate nodule; and

determining, for each candidate nodule in said first plurality of candidate nodules, at least one respective exterior feature value, including one of an average pixel value, full width at half maximum (FWHM), and full width at tenth maximum (FWTM), based on pixel values in an exterior region of each candidate nodule.

12. (Original) The method of claim 11, wherein the removing step comprises:
removing false positive nodule candidates from said first plurality of nodule candidates based on said at least one respective interior feature value, said at least one respective exterior feature value, and respective locations of the nodule candidates within said anatomical region.

13. (Original) The method of claim 1, wherein the determining step comprises:
determining said at least one nodule from said second plurality of nodule candidates
based on said image pixel values using a Multi-MTANN (Massive Training Artificial Neural
Network).

14. (Original) The method of claim 13, wherein the determining step comprises:
training a plurality of MTANNs to distinguish nodules from a respective type of non-
nodules; and
classifying, based on said image pixel values, said second plurality of nodule
candidates using said plurality of trained MTANNs to obtain said at least one nodule.

15. (Original) The method of claim 1, wherein the determining step comprises:
determining, based on said respective nodule feature values, said at least one nodule
from said second plurality of nodule candidates using a linear discriminant analysis.

16. (Currently Amended) A computer program product embedded on a computer-
readable medium, the computer program product including storing program instructions for
execution on a computer system, which, when executed by the computer system, cause the
computer system to perform the method recited in any one of claims 1-15.

17. (Original) A system configured to detect said at least one nodule in said medical
image of said subject by performing the steps recited in any one of claims 1-15.